Vibration monitor for machine elements

Field of the invention

The invention relates to a measuring system which is installed in a stationary manner on machine housings in order to register the machine vibrations (structure-borne sound) and/or the temperature continuously, in order to indicate changes or disturbances in the machine system in good time.

Background of the invention

In order to constantly monitor the condition of the machine, in particular the condition of the antifriction bearings in machines, measuring systems (vibration monitors) are arranged in a stationary manner on machines. For this purpose, these vibration monitors are screwed into the lubrication hole of antifriction bearing housings in order to register the machine vibrations in the immediate vicinity of the antifriction bearing. In order to permit relubrication of the antifriction bearings without dismantling the vibration monitor, the vibration monitor has a hollow mounting pin.

Such a measuring system is described, for example, in US 6,236,328 B1. The problem with the vibration monitor shown there is that the printed circuit boards are connected directly to the mounting pin, and the vibration sensor is arranged on one of the printed circuit boards. As a result of the direct arrangement of the printed circuit boards on

the mounting pin, all the vibrations of the machine system are transmitted to the bearing pin and therefore to the printed circuit boards. As a result of the direct fixing of the printed circuit boards to the mounting pin, the electronic components are highly loaded by the continuous vibrations (possible early failure of the components). The direct fixing of the printed circuit boards to the mounting pin firstly dampens the machine vibrations and, secondly, the printed circuit boards have an inherent vibration behavior, so that the vibration sensor on the printed circuit boards is able to pick up only damped or distorted vibrations. As a result of this damped or distorted sensing of the vibrations, the interpretation of the measured signal is extremely difficult and changes in the vibratory behavior of the machine can be registered only coarsely.

There is, therefore, the object of proposing a measuring system in which the vibration sensor can pick up the machine vibrations in undamped form and the printed circuit boards having the electronic components are largely protected with respect to the machine vibrations.

Description of the invention

According to the invention, the object is achieved by the features of claim 1.

The core of the invention is that the vibration sensor is connected directly to the machine housing via a

metal bushing, which is arranged outside the mounting pin. The printed circuit boards are mounted in a housing, which is arranged around the mounting pin via damping elements. The housing is connected to the metal bushing.

As the mounting pin is screwed into the lubrication hole opening in the accommodating machine housing, the housing and the vibration sensor housing can rotate freely around the mounting pin. The housing can thus be aligned as it is screwed in, so that, if appropriate, cable connections or optical indicating devices point in a specific direction. In this way, the machine operator or the maintenance personnel can read these indicating elements directly. When the mounting pin is tightened (in the end position), the metal bushing is pressed against the vibration sensor housing and in this way contact is made between the vibration sensor and the metal bushing. A direct connection for the structure-borne sound is thus created between machine housing, metal bushing and vibration sensor. At the same time, the housing of the measuring system is fixed in the end position by a force fit and so as to be secured against rotation.

Brief description of the figures

The invention will be explained using a figure.

Detailed description of the figures

The vibration monitor or the measuring system 1 is shown in figure 1. The mounting pin 2 is screwed with its thread 4 into the lubrication hole opening 16 of the accommodating machine housing 15. For this purpose, the mounting pin 2 is screwed in with a spanner size 4a. As the mounting pin is screwed in, the housing 5, 5a and the vibration sensor housing 7 can be rotated about the former. In the end position of the screwing-in of the mounting pin 2, the metal bushing 6 is then pressed against the vibration sensor housing 7 until the latter comes to rest on the projection 8 of the mounting pin 2. The metal bushing 6 is additionally connected directly to the lower housing part 5 of the measuring system 1 so as to be fixed against rotation. After the mounting pin has been tightened, the lower part of the housing 5 is fixed on the machine housing by a force fit and so as to be secured against rotation. The upper housing part 5a is screwed to the lower housing part 5 and thus also fixed. The damping elements in the housing are designated by the reference number 13 and are located firstly between the two housing parts 5, 5a and secondly between the upper housing part 5a and the mounting pin 2. A further possibility is the arrangement of a damping element 13a (O-ring) between printed circuit board 9 and housing 5. The printed circuit board with the electronic components 9 is arranged within the lower housing part 5 and, in this example, is designed to be rotationally symmetrical in

relation to the mounting pin 2. The printed circuit board is held by the lower housing part 5 and has no direct connection to the mounting pin 2. Provided on the printed circuit board 9 is a battery 11, which permits operation of this measuring unit without a cable connection. In addition, an aperture 12, through which a power supply via cable would also be possible, is provided in the lower housing part 5. In addition, in this example, a temperature sensor 10 is also provided, which is pressed against the mounting pin outside the printed circuit board. The battery 11 on the printed circuit board 9 can be changed by unscrewing the upper housing part 5a. The operating condition of the machine system is indicated to the operator or to the maintenance personnel via light-emitting diodes 14, which are arranged on the printed circuit board 9. In order to be able to detect these two light-emitting diodes 14 from all sides, the upper housing part 5a is produced from a transparent plastic. Since the housing 5, 5a can be rotated with respect to the mounting pin as the latter is tightened, it can be aligned in such a way that the cable 12 or the light-emitting diodes 14 are located such that they can be detected easily. The lubricating grease can get into the antifriction bearing housing from outside through the passage hole 3 of the mounting pin 2 without the measuring system having to be dismantled.

In this example, the housing 5, 5a of the measuring

system 1, the vibration sensor housing 7, the printed circuit board 9 and the metal bushing 6 are designed to be rotationally symmetrical about the mounting pin.

List of designations

1	Vibration monitor or measuring system
2	Mounting pin
3	Passage hole in the mounting pin
4	Thread on the mounting pin to be accommodated in the machine housing
4a	Spanner size for tightening the mounting pin
5	Lower half of the housing of the measuring system
5a	Upper half of the housing of the measuring system
6	Metal bushing connected to the lower half 5 of the housing
7	Vibration sensor housing
7a	Vibration sensor
8	Projection on the mounting pin 2
9	Printed circuit board with electronic elements
10	Temperature sensor
11	Battery
12	Aperture for cable leadthrough in the housing 5
13	Damping elements
13a	Damping elements
14	Light-emitting diodes
15	Machine housing
16	Lubrication hole